

TSVETKOV, V.

25372. TSVETKOV, V. i MARININ, V.

Dipol'nye momenty molekul nekotorykh zhidkikh kristalov i elektricheskoe dvoynoe luchepelomlenie ikh rastvorov. Zhurnal eksperim i teoret. Fiziki, 1948, Vyp. 7, S 641-50. - Bibliog: S. 650

SO: Letopis' Zhurnal Statey, No. 30, Moscow, 1948

2

C A

Depolarization of the light scattered by polymer solutions. E. Prisman and V. Farkov. (Leningrad State Univ.). *J. Exptl. Theoret. Phys.* (U.S.S.R.) 18, 126-31 (1948) (in Russian).—The degree of depolarization  $\Delta$  of light incident along the x axis and scattered in the direction of the y axis, was detd. for both unpolarized incident light ( $\Delta_0$ ), and for incident light polarized horizontally, i.e., with the electric vector parallel to the xy plane ( $\Delta_h$ ) and vertically ( $\Delta_v$ ). (1) Detns. on pure styrene, in the course of its polymerization at 60°, showed  $\Delta_h$  to be practically const. = 1, irrespective of the progress of polymerization;  $\Delta_0$  and  $\Delta_v$  remain unchanged from the value of the monomer over approx. the 1st 6 hrs. Then there is an abrupt fall, followed by a very slow prolonged rise. The fall indicates a sudden decrease of the anisotropy of the scattering particles; the residual depolarization is due to continued influence of the monomer. Particularly noteworthy is the indication of the sudden formation of isotropic polymer chains at an early and well-detd. stage of the polymerization process, as opposed to gradual growth of polymer particles which would be accompanied by progressive and not by the observed sudden fall of  $\Delta_0$  and  $\Delta_v$ . The constancy of  $\Delta_h = 1$  at all stages shows that the scattering particles are much smaller than the wave length of light. The decrease of the anisotropy  $\Delta^2 = 10 \Delta_v / (6 - 7 \Delta_0)$  in the course of the polymerization, is addnl. proof of the clue shape of the polymer mol., as opposed to a rod shape which would call for a const.  $\Delta^2$ . Pure methyl

over →

ASB-15A METALLURGICAL LITERATURE CLASSIFICATION

FROM: STP-BLAVN

EXTRACT ONE

EXTRACT ONE ONLY 1951

methacrylate shows also a const.  $\Delta_s = 1$ ;  $\Delta_s$  and  $\Delta_p$  fall steeply, but not suddenly, from the very start of the polymerization, reach a low at about 8 hrs. and then rise very slowly. (2) Solns. of polystyrene in  $\text{CCl}_4$  gave a very low  $\Delta_s \approx 0.005$ , and  $\Delta_p = \text{const.} = 1$ . With increasing concn.,  $\Delta_s$  and  $\Delta_p$  first remain const. up to about 5 vol. %, then increase. At the very lowest concns., rise of  $\Delta_s$  with increasing diln. between about 0.3 and 0 vol. % was observed on one sample. Tech. polyisobutylene (opanol) showed a different behavior;  $\Delta_s$  and  $\Delta_p$  are const. only at lowest concns. (up to about 0.2 vol. %). They then increase with increasing concn., the smallest  $\Delta_s$  and  $\Delta_p$  being distinctly higher than in the case of polystyrene;  $\Delta_s$  increasing slowly and  $\Delta_p$  very rapidly with the concn.;  $\Delta_s$  is greater than 1 even in dil. soln. and increases still further with the concn. (3) The small value of  $\Delta_s \approx 0.005$  (in 5 vol. % soln. in  $\text{CCl}_4$ ) is of the same order as that found for the very nearly isotropic gaseous  $\text{CCl}_4$  or for oil emulsions. It can neither be accounted for by a rotation-ellipsoid symmetry of the mol. nor by Brownian movement. Likewise, Rousset's multiple scattering, which calls for increase of the  $\Delta$  with the concn. in dil. soln., is inapplicable. The observed  $\Delta_s$  can only be ascribed to the effect of the solvent; the anisotropy of the dissolved polymer particles is evidently negligible, and is consistent with the kinked-clue shape of the mol. In the case of polyisobutylene,  $\Delta_s$  is greater than 1 and indicates that the size of the particles is comparable to the wave length of light, hence, the scattering particles must be micellar aggregates of many mols., each mol., of mol. wt. 130,000 and degree of polymerization 2000, being at most  $2 \times 10^3$  A. long if stretched, less than that if folded. The aggregates obviously are unstable and disaggregate on diln., hence the fall of  $\Delta_s$  with falling concn. A limit  $\Delta_s = 1$  at infinite diln. is possible. N. Thom

PROCESSING AND PROPERTIES INDEX

2

**Acoustic birefringence and relaxation time of liquids.**  
 V. N. Tsvetkov and V. H. Eskin. *Zhur. Eksp. Teor. Fiz.* (J. Exptl. Theoret. Phys.) 18, 614-21 (1948); cf. C.A. 40, 6313<sup>a</sup>.—Supersonic birefringence  $\Delta n$ , defined by  $(\Delta n)^2/\omega = (Mg/c)(f/\rho)/\omega$  [where  $M$  = flow-birefringence const. of the liquid,  $\eta$  = viscosity,  $c$  = velocity of light in the liquid,  $\rho = d \cdot \omega = 2\pi\nu$ , where  $\nu$  = frequency of the supersonic wave], in conformity with Lucas' theory (*J. phys. Radium* 10, 151 (1939); *Compt. rend.* 209, 837 (1939)), was measured, by polarization photometry, as a function of  $\nu$  and of the supersonic intensity  $f$ , detd. by the pressure  $p$ , the square root of which was ascertained to be proportional to the voltage  $V$  applied to the piezo-quartz. Proportionality between  $\Delta n$  and  $\sqrt{p}$ , hence also with  $\sqrt{f}$ , at  $p = 11.1 \times 10^4 = 0.0 \times 10^4$  atm., was confirmed for linseed oil. Further measurements for other liquids were made relative to linseed oil. The ratio  $m$  of  $\Delta n$  of the liquid to that of linseed oil, at const.  $f$ , remains independent of  $\nu$ , in the above range, for linseed oil ( $m = 1$ , by definition), oleic acid ( $m = 0.94$ ), ethyl cinnamate (0.28) and sunflower oil (1.1); in a 2nd group of liquids,  $m$  decreases with increasing  $\nu$ , thus (between  $\nu = 0.9 \times 10^4$  and  $11.1 \times 10^4$ ), for vacuum oil from 5.2 to 1.7, castor oil 13.0 to 2.3, two samples of polymerized sunflower oil ( $\eta = 0.80$  and 4.7, resp.), 1.7 to 1.3 and 5.3 to 2.3, resp. This decrease of  $m$  is faster the higher the viscosity of the liquid. In the 1st group, the const.  $m$  is equal to the ratio of  $M_g$  of the liquid to that of the standard linseed oil, and the observed  $\Delta n$  is in acceptable agreement with that calculated by the Lucas formula, e.g., for ethyl cinnamate,  $M_g = 34.5 \times 10^{-11}$ ,  $\rho = 1.05$ ,  $c = 1.4 \times 10^8$ ,  $\omega = 7 \times 10^7$ ,  $p = 7$  bar and  $f = cp/2 = 0.8 \times 10^9$ , hence  $\tau = 4.5 \times 10^{-10}$ ,  $\text{exptl. } \Delta n = 3 \times 10^{-4}$ . The velocity gradient in a supersonic field of const.  $f$  being proportional to  $\nu$ ,  $\Delta n$  for the 1st group is a linear function of  $\nu$ . For the 2nd group, curves of  $\Delta n$  against  $\nu$  are concave to the axis of  $\nu$ , with their initial slopes equal to  $m_0$ ,  $m_0$  relative to linseed oil. The curvature in the 2nd group can be ascribed to orientation relaxation of the moles, which, in terms of the theories of Peterlin and of Frenkel, leads to an expression  $(\Delta n)^2/\omega = (Mg/c)(f/\rho)^{1/2}(\omega(1 + \omega^2\tau^2))^{-1/2}$ , where the relaxation time  $\tau$  can be detd. from the exptl. data by  $\tau = \omega^{-1}(\omega_0/m)^{1/2} - 1$ . For castor oil and vacuum oil,  $\tau$  is acceptably independent of  $\nu$  (resp.,  $1.5 \times 10^{-9}$  and  $4.5 \times 10^{-9}$  sec.), but for the high- $\eta$  polymerized sunflower oil it decreases with increasing  $\nu$ , which indicates several relaxation times, evidently owing to polydispersity. A slight decrease of  $\tau$  with increasing  $\nu$  in the case of castor oil might indicate a small amt. of polymerization; the value of  $\tau$  is very close to that detd. by Kitchin and Muller (C.A. 23, 2005) from absorption of radio waves. The 2 samples of polymerized sunflower oil show strikingly small curvature, with  $\Delta n$  increasing nearly linearly with  $\nu$  but with a slope very distinctly below that detd. by  $M_g$ . This behavior may be explained in the light of the previously (T. and Prisman, C.A. 41, 6118<sup>a</sup>) established formation of high-mol. fractions at a very early stage of polymerization, resulting in a sharp increase of  $m_0$  relative to the unpolymerized bulk of the oil; such high-mol. components become rapidly completely immobile with increasing  $\nu$ , and the oil then shows no relaxation at all.

TSVETKOV, V.

PA 9/49T86

USSR/Physics

Refraction, Double  
Dielectric - Constants

Jul 48

"Dipole Moments of the Molecules of Some Liquid Crystals and the Electric Double Refraction of Their Solutions," V. Tsvetkov, V. Martin, Phys Inst, Leningrad State U, 3 pp

"Zhur Eksp 1 Teoret Fiz" Vol XVIII, No 7

Measurement of dielectric constants and analysis of electrical double refraction of solutions of seven materials suitable for forming liquid crystals. Compares values found in dielectric analyses, for dipole moments of molecules, with

9/49T86

USSR/Physics (Contd)

Jul 48

values obtained for electrooptical constants of materials in solution. By this comparison, angle formed by molecular dipole moment with molecular axis is found and then compared with dielectric properties. Shows that liquid crystals have negative dielectric anisotropy whose molecules have a dipole forming a nearly straight angle with molecule's axis, and that positive dielectric anisotropy is inherent in anisotropic liquids whose molecules have dipole moments forming small angles with molecular axis. Negative dielectric anisotropy is determined, apparently by molecular dipoles anisotropic rotation; positive dielectric anisotropy, by molecules' polarization.

9/49T86

TSVETKOV, V. N.

PA 9/49T87

USSR/Physics  
Refraction, Double  
Relaxation Phenomena

Jul 48

"Acoustical Double Refraction and the Relaxation Time of Liquids," V. N. Tsvetkov, V. Ye. Eskin, Phys Inst, Leningrad State U, 8 pp

"Zhur Ekspert i Teoret Fiz" Vol XVIII, No 7

Study of relationship of acoustic double refraction in linseed oil to intensity of ultrasound for various given frequencies; character of acoustic double refraction in a series of low molecular liquids, as well as in eight liquids in frequency interval  $0.9 \times 10^6$  --  $11.1 \times 10^6$  sec<sup>-1</sup>. Notes relaxation phenomena in

9/49T87

USSR/Physics (Contd)

Jul 48

four of liquids. Approximate times of relaxation for molecules of castor oil and mineral vacuum oil found to be:  $1.5 \times 10^{-7}$  sec and  $4.5 \times 10^{-8}$  sec.

9/49T87

1ST AND 2ND ORDER		PROCESSES AND PROPERTIES INDEX		3RD AND 4TH ORDER	
<p>Relaxation effects in liquids in supersonic fields. V. N. Tavetkov and V. E. Eskin. <i>Doklady Akad. Nauk S.S.S.R.</i> 59, 1080-82 (1948). — The acoustic birefringence <math>B</math>, in a supersonic field of const. intensity, was detd. relative to that of linseed oil (of viscosity <math>\eta</math> 0.49 poise) taken = 1 at all frequencies from <math>0.9 \times 10^6</math> to <math>11.1 \times 10^6</math> sec.<sup>-1</sup>, for 7 liquids of different <math>\eta</math>: oleic acid (I) (<math>\eta</math> 0.34), ethyl cinnamate (II) (0.07), sunflower oil (III) (0.57), vacuum oil (IV) (5.2), castor oil (V) (9.1), polymerized sunflower oil (VI) (0.89), and a higher polymerized sunflower oil (VII) (4.7). The ratio <math>m</math> of the <math>B</math> of the liquid investigated and of linseed oil was found practically independent of the frequency <math>\omega</math> for the low-<math>\eta</math> liquids I–III, and equal to the ratio <math>m_0</math> of the flow birefringence; hence, for these liquids, <math>B</math> is a linear function of <math>\omega</math>. The deviation from linearity in the case of IV–VII indicates relaxation effects. The relaxation times <math>\tau</math>, calcd. by <math>\tau = (1/\omega) \sqrt{(m_0/m)^2 - 1}</math> vary, with <math>\omega</math> from <math>5.7</math> to <math>69.0 \times 10^6</math>, for V between <math>1.77</math> and <math>1.15 \times 10^{-7}</math> (av. <math>1.5 \times 10^{-7}</math> sec.), for IV between <math>3.48</math> and <math>5.82</math> (av. <math>4.5 \times 10^{-7}</math> sec.), for VII between <math>2.78</math> and <math>0.62 \times 10^{-7}</math> sec.; only in the latter case does one observe a systematic fall of <math>\tau</math> with increasing <math>\omega</math>, indicative, no doubt, of the presence of several <math>\tau</math>, owing to polydispersity of the system. N. Thom</p>					
<p>ASH-SLA METALLURGICAL LITERATURE CLASSIFICATION</p>					
FROM INVESTIGATOR		FROM HOWEVER		FROM INVESTIGATOR	
1ST ORDER		2ND ORDER		3RD ORDER	
1ST ORDER		2ND ORDER		3RD ORDER	

COMMON ELEMENTS		COMMON SYMBOLS	
<p><b>CA</b></p> <p><b>Electric birefringence of solutions of normal alcohols.</b>  V. N. Trvetkov and V. Marbut. <i>Doklady Akad. Nauk S.S.S.R.</i> 82, 67-70 (1948).—The Kerr const. <math>K</math> was detd. in C<sub>17</sub>H<sub>35</sub>OH, for (data in units <math>\times 10^{-17}</math>): PrOH -0.3, BuOH -16.0, AmOH -17.0, C<sub>11</sub>H<sub>23</sub>OH -21.0, C<sub>13</sub>H<sub>27</sub>OH -19.7, C<sub>15</sub>H<sub>31</sub>OH -18.5, C<sub>17</sub>H<sub>35</sub>OH -13.0, C<sub>19</sub>H<sub>39</sub>OH -6.2, C<sub>21</sub>H<sub>43</sub>OH + 3.5, C<sub>23</sub>H<sub>47</sub>OH + 13.0, C<sub>25</sub>H<sub>51</sub>OH + 70.3. Calcd. values of <math>K</math> were obtained by <math>K = (3/5) \times (N/45 \times 10^3) \times (\sum (\gamma_i - \gamma_o)^2 + (1/3) \sum (\gamma_i - \gamma_o) \times (\gamma_i - \gamma_o))</math> where the summation extends over <math>i, j = 1, 2, 3</math>, <math>\gamma_i</math> being the components of the dipole moment in the same 3 directions. For the polarizabilities <math>\alpha_1, \alpha_2, \alpha_3</math> of a CH<sub>2</sub> group one finds, on the assumption of an additivity of the polarizabilities of the C—H and the C—C bonds, and with the values of Denbigh (<i>C.A.</i> 35, 671<sup>1</sup>) <math>\alpha_1 = 24.3 \times 10^{-24}</math>, <math>\alpha_2 = 19.3 \times 10^{-24}</math>, <math>\alpha_3 = 14.7 \times 10^{-24}</math>; a test is provided by a comparison of the mean value, <math>\alpha = (\alpha_1 + \alpha_2 + \alpha_3)/3 = 19.4 \times 10^{-24}</math>, with the value derived from the mean increment of the molar refraction per CH<sub>2</sub> group (<math>\approx 4.6</math>), giving <math>\alpha = 18.3 \times 10^{-24}</math>, i.e. a divergence of only 6%. For a strictly rigid, sufficiently long chain, the <math>\gamma</math> can be taken <math>\gamma_i = \alpha_i (s + 1)</math>, where <math>s</math> = no. of CH<sub>2</sub> groups, <math>\alpha</math> = a const. with allowance for the effect of the end groups. Replacing the <math>\gamma_i</math> in the expression for <math>K</math>, one has, with <math>\alpha = 2</math>, <math>K = (2/5) \times (N/45 \times 10^3) \times [6 \Delta \alpha^2 (s + 2)^2 + 3 \Delta \alpha (s + 2) (\alpha_1^2 - \alpha_2^2)/3T]</math>, where <math>\Delta \alpha = \alpha_1 - \alpha_2 = \alpha_2 - \alpha_3 = 4.6 \times 10^{-24}</math>. The dipole moment is composed of the moment of the C—O bond = <math>0.7 \times 10^{-18}</math>, lying in the plane of the C—C bond, and of the moment of the O—H bond = <math>1.7 \times 10^{-18}</math>, the direction of which is unknown. It obviously cannot lie in the same plane as C—O, as, in that case, <math>\beta_1 = 0</math> and <math>K</math> could not be neg. at any <math>s</math>. The <math>K</math> calcd. on the assumption of O—H pointing in the same direction as C—H, which gives <math>\beta_1 - \beta_2 = -2.4 \times 10^{-18}</math>, are too neg. as compared with the exptl. figures. Best agreement is obtained with <math>\beta_1 - \beta_2 = -0.65 \times 10^{-18}</math> which corresponds to locating the O—H bond between the plane of the C—C bonds and that of the C—H bonds. The agreement proves that paraffins up to <math>s = 20</math> behave in soln. as straight rigid chains. N. Thon</p>		<p><b>185 AND 6TH CO-151</b></p>	
<p><b>ASB-35A METALLURGICAL LITERATURE CLASSIFICATION</b></p>		<p><b>REGION 804197</b></p>	
<p><b>REGION 804197</b></p>		<p><b>REGION 804197</b></p>	



TSVETKOV, V.

PA 36/49T72

USSR/Physics  
Light- Diffraction  
Benzene

Sep 48

"Temperature Relationship of Dynamic Double Diffraction of Benzene and Other Liquids," V. Tsvetkov, Kh. Kibardina, Phys Inst, Leningrad State U, 4 pp

"Dok Ak Nauk SSSR" Vol LXII, No 2

Dependence of double diffraction on temperature was studied for the following liquids: benzene, acetophenone, naphthalene, biphenyl, diphenyl ether, diphenylamine, salol and lactic acid. Temperatures close to those of crystallization were used. Submitted by Acad A. A. Lebedev, 9 Jul 48.

36/49T72

PA 35/49198

TSVETKOV, V.

USSR/Physics  
Sound - Refraction  
Sound - Measurements  
Dec 48

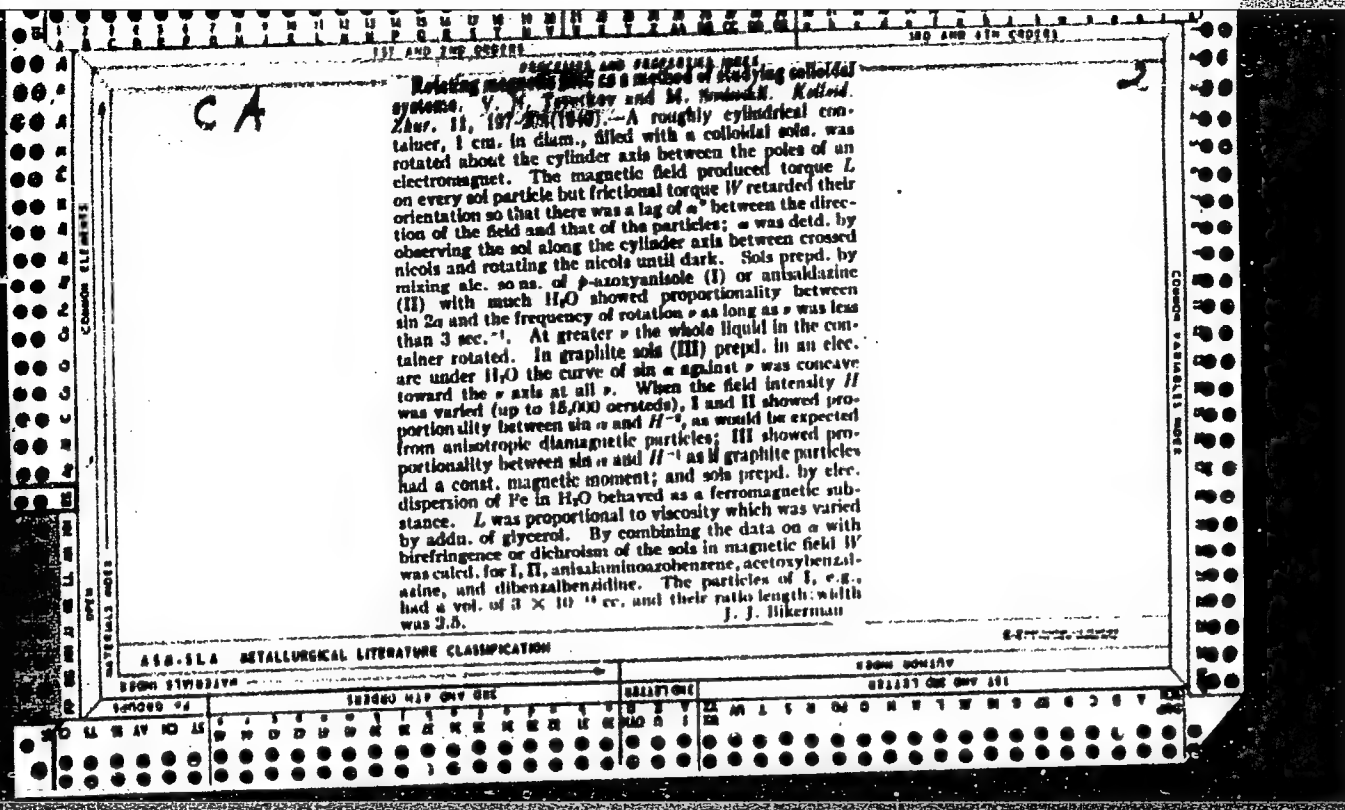
"The Compensated Method of Measuring the Acoustic  
Double-Refraction of Liquids," V. Tsvetkov, V. N.  
Marin, Phys Inst Leningrad State U, 4 pp 613.26

"Dok Ak Nauk SSSR" Vol LXIII, No 6

(5)

Suggests method for direct compensation of double-  
refraction with the aid of a compensator (wedge-  
shaped or elliptical) which allows measuring the  
value of the acoustic double-refraction at any point  
in the field. Diagram shows optical arrangement for  
the method, and pictures of acoustic double-refrac-  
tion where the distance between two neighboring  
light (or dark) bands is one half the ultrasonic  
wave length. Graph shows acoustic double refrao-  
tion in castor and sunflower oils versus effective  
voltage on the quartz for ultrasonic frequency of  
2.8 · 10<sup>6</sup>. Submitted by Acad A. A. Lebedev,  
18 Oct 48.

35/49198



TSVETKOV, V.

FA 170T105

USSR/Physics - Colloids

Jun 49

"Studying the Geometric and Magnetic Properties of Colloidal Particles by the Methods of Magnetic and Dynamic Birefringence of Light," V. Tsvetkov, M. Sosinskiy, Leningrad State U

"Zhur Eksper i Teoret Fiz" Vol XIX, No 6, pp 543-52

New method for studying colloidal systems by double refraction and dichroism of colloidal solution in stationary and rotating magnetic field, and in laminar flow determines volume of colloidal particles, their coefficient of elongation, and magnitude of magnetic anisotropy. Submitted 27 Feb 49.

170T105

**Dynamics double refraction in solutions of polymers of divinyl and methyl methacrylate.** V. N. Tsvetkov and A. Petrova. *Zhur. Fiz. Khim.* 23, 728-78 (1949); cf. C.A. 40, 2059; 42, 1081s. — (1) Butadiene (I) polymerized with Na was fractionated by pptg. dichloroethane soln. with EtOH and the fractions were dissolved in gasoline. The relative viscosity  $\eta$  of these solns. was independent of the velocity gradient  $g$  for low-mol. fractions and decreased the velocity gradient for high mol. wt. fractions; at  $g > 15000 \text{ sec}^{-1}$   $\eta$  was independent of  $g$  for all fractions. The dynamo-optical const.  $X = \Delta n/gC\eta$  was characteristic for every fraction and proportional to its (viscometric) mol. wt.  $M$ ;  $\Delta n$  is birefringence caused by  $g$  (detd. in 0.1-0.3 mm. thick layer between a stationary and a rotating cylinder).  $C$  concn.,  $\eta$  the viscosity of the solvent. For the extinction angle  $\alpha$  the equation found is  $\tan 2\alpha = \tan 2\alpha_0 = 0.67/g\eta\eta_0/W$ ;  $\alpha_0$  is an empirical const. (although it should be zero according to theory),  $W$  is the friction coeff. for rotation.  $W$  increases with  $M$  less rapidly than  $M^2$ ; this constitutes a difference between linear polymers, cf. C.A. 40, 788', and branched polymers such as poly-I. The  $X$  in solvents whose  $n$  is near 1.47 ( $\text{CHCl}_3$ , dichloroethane, and  $\text{CCl}_4$ ) is less than in gasoline,  $\text{Et}_2\text{O}$ ,  $\text{C}_6\text{H}_6$ ,  $\text{PhCl}$ , and tetralin (whose  $n$  is smaller or greater), showing that the flow birefringence is due mainly to the shape of the polymer mol. (2) Co-due polymers of I and styrene have (in tetralin and dichloroethane) a pos.  $X$  and a pos. photoelastic effect as long as the amt. of I is less than about 33%; the sign of both is pos. in I-rich polymers. Apparently, photoelastic effect, like shape effect, is a part of the Maxwell effect. (3) Poly(methyl methacrylate) (II),  $M = 450,000$ , has a  $\eta$  which is small for its  $M$ ;  $\eta$  in  $\text{COMe}$  and  $\text{CHCl}_3$  is independent of  $g$  at  $g > 8000$  and, in this range, little depends on the solvent. The  $\eta$ ,  $X$ , and  $\alpha$  of the solns. are lowered when large  $g$  ( $> 35,000$ ) is applied for several min., thus indicating decrease in the particle size. In  $\text{COMe}$ ,

$\Delta n/g = \text{const.}$  up to  $C = 0.5\%$ , and  $X = \Delta n/gC\eta$  in all solvents ( $\text{COMe}$ ,  $\text{AcOEt}$ ,  $\text{CHCl}_3$ ,  $\text{C}_6\text{H}_5\text{Cl}$ ,  $\text{C}_6\text{H}_6$ ,  $\text{PhCl}$ , and  $\text{CHCl}_3$ ).  $X$  has a min. in  $\text{C}_6\text{H}_6$  whose  $n$  is near that of II (1.49), showing the preponderance of the birefringence due to shape. The mol. of II seems to be a relatively rigid.

FROM SOURCE

TSYBENOV, V. Na.

24475

TSYBENOV, V. Na. Stadionakh Yevropy. (Sport v stranakh nar. Demokratii).  
Ogonek, 1949, No. 31, S. 30-31.

SO: Letopis, No. 32, 1947.



**Relaxation of the enforced anisotropy in liquids.**  
V. N. Tsvyrkov and V. R. Eskin. *Doklady Akad. Nauk S.S.S.R.* 67, 203-6 (1949); cf. C. A. 43, 3681d.—The dependence of the orientation relaxation time  $\tau$  on the viscosity  $\eta$  was det'd. by measurements of the acoustic and the flow birefringence of castor oil, pure at different temps. or dil'd. with gasoline at a const. temp., relative to linear  $\tau$  of an standard liquid, with the aid of the formula  $\tau = (1/\omega) [(m_0/m)(\eta_1 + \omega\tau_1)^2 - 1]/\omega^2$ , where  $\omega = 2\pi\nu = 6 \times 10^8 - 7 \times 10^8 \text{ sec}^{-1}$ ,  $m$  = ratio of the acoustic birefringences of the castor oil and the standard liquid at the frequency  $\omega$ ,  $m_0$  = the same ratio in flow birefringence ( $\omega = 0$ ),  $\tau_1$  = relaxation time of the standard liquid; if  $\omega\tau_1 \ll 1$ , the formula simplifies to  $\tau = (1/\omega) [(m_0/m)^2 - 1]/\omega^2$ , exp'tly. found to be sufficient except at  $\omega = 70 \times 10^8 \text{ sec}^{-1}$ . On variation of  $\eta$  by varying the temp. of pure castor oil, the results were, at 15, 20, 25, 30, 40, 50°,  $\eta = 17.10, 9.40, 6.27, 4.50, 2.41, 1.27$  poises, and  $10^4 \tau$  (sec) = 23.0, 17.1, 11.7, 6.9, 4.2, 1.6 sec. At the const. temp. of 20°, with the castor oil dissolved in gasoline at the concn. 100 (pure oil), 95.8, 93.2, 89.1, 86.1, 83.7, 80.1, 70.0%,  $\eta = 0.45, 0.72, 0.43, 0.87, 2.81, 2.67, 1.00, 1.20$  poises,  $10^4 \tau$  (sec) = 17.9, 11.1, 7.4, 5.2, 3.6, 4.8, 3.3, 1.7 sec. At a given  $\eta$ , the fluctuations of  $\tau$  with varying  $\omega$  do not exceed the limits of exp'tl. error. This indicates that the orientation relaxation can be described in terms of our single  $\tau$  (monodisperse system). The coeff. of rotational friction of the mol.,  $M = 8T/\omega D$ , where the rotational diffusion coeff. of the mol.  $D = 1/\tau$ , calcd. from the data

at different temps., is fairly const.,  $3.3 \times 10^{-11} - 4.6 \times 10^{-11}$ , without any systematic variation in terms of  $\eta$  or the temp. Consequently, temp. changes of the "microscopic"  $\eta$  (that involved in the definition of  $W$ ) coincide with those of the "macroscopic" (i.e. viscosimetric)  $\eta$ . This coincidence is not fulfilled in the case of variation of  $\epsilon$ , where the fluctuations of  $W$  exceed the limits of expl. error. At  $80^\circ$ ,  $\eta = 1.27$  poise,  $\epsilon = 15 \times 10^{-12}$ , i.e. only 4 times greater than the value detd. for  $\text{CHCl}_3$  from Kerr-effect measurements (Hanle and Maercks, C.A. 34, 31487); for castor oil, extrapolation to  $\eta \sim 0.005$  poise would give  $\epsilon = 6 \times 10^{-11}$ , i.e.  $1/10$  of the value for  $\text{CHCl}_3$ . On the other hand, for  $\text{CHCl}_3$ , from dielec. losses,  $W \sim 5 \times 10^{-10}$ , comparing with  $W \sim 4 \times 10^{-11}$  for castor oil; the agreement is satisfactory if the elongated form and the much larger vol. of the ricinoleic acid triglyceride mol. are taken into account. Thus, the relaxation time of optical anisotropy of liquids, detd. by acoustic birefringence, is in agreement with that derived from measurements of dielec. losses, but not the value calcd. from the Kerr effect.

N. Thou

N. Thou

ASME METALLURGICAL LITERATURE CLASSIFICATION



TSVETKOV, V.

PA 2/50T107

USSR/Physics - Ultrasonics  
Optics

Sep 49

"An Optical Method of Measuring the Speed of  
Ultra Sound," V. Tsvetkov, V. Marlin, Phys Inst,  
Leningrad State U Iment A. A. Zhdanov, 4 pp

"Dok Ak Nauk SSSR Nov Ser", Vol LXVIII, No 1

Introduces a new optical method based on direct  
observation of an ultrasonic grating created by  
a plane ultrasonic wave during its stroboscopic  
illumination with aid of a light lock synchronized  
with ultrasonic generator. Used this method to  
obtain molar speed of ultra sound in a number of

2/50T107

USSR/Physics - Ultrasonics  
Optics (Contd)

Sep 49

saturated fatty acids and normal alcohols.  
Submitted by Acad A. A. Lebedev 27 Jun 49.

2/50T107

CA

2

Investigation of fractionated polybutadienes by a dynamo-optical method. V. N. Tavetkov, A. I. Petrova, and I. Ya. Poddubnyi (Leningrad State Univ., Leningrad). *Zhur. Fiz. Khim.* 34, 996-1003 (1960).—Sols. of various fractions of polybutadienes obtained at various temps. of polymerization were studied by dynamo-optical double refraction. The double refraction was linearly related to the rate gradient. Conclusions are drawn concerning the form of the macromol. in various solvents and the effect of the polymerization temp. on the configuration of the mol.  
Paul W. Hawerton

CA

**Polarization-interferometer study of diffusion in liquids.**  
V. N. Tyutkov (Leningrad State Univ.). *Zhur. Eksp. Fiz. i Teor. Fiz.* 21, 701-10 (1951).—The change of the refractive index  $n$  in the interdiffusion of 2 liquids of  $n$  differing by  $\Delta n$  is followed by placing the optical trough with the 2 liquids one above the other, in the path of a light beam polarized and split into 2 parallel beams, at a distance  $s$  from each other, by means of a quartz plate placed in front of the trough. The 2 beams pass above the boundary. An identical plate, placed behind the trough, reunites the 2 beams into one, and the interference is observed by means of a Nicol prism crossed with the polarizer. The gradient, at a distance  $s$  from the boundary, is  $dn/ds = \Delta n \sqrt{h/\pi t}$ , with  $h = 1/Dt$ , where  $D$  = diffusion coeff., and  $t$  = time. The path difference  $\delta$  acquired over the thickness  $h$  of the trough is  $\delta = (h/\lambda)(n_1 - n_2)$ , where  $n_1$  and  $n_2$  correspond to layers distant by  $s$ . With  $x_0$  designating the distance from the boundary to the layer lying midway between the 2 beams, then  $\delta = (\Delta n h/\lambda) \int_{x_0-a}^{x_0+a} \sqrt{h/\pi t} dx$ , the lower and upper limit of the integral being, resp.,  $x_0 - (a/2)$  and  $x_0 + (a/2)$ . The detn. of  $D$  consists in plotting  $\delta$  as a function of  $(x_0/a)$ , measuring the max.  $\delta_m$  at  $t = 0$  and at another  $t > 0$ , and calc.  $h$ ; from that,  $D = 1/ht$ . An alternative procedure is measurement of the surface area under the curve  $\delta(x_0)$ . A convenient approx. formula, applicable at long times  $t$  (small  $\delta$ ), is  $\delta = A t^{-1/2}$ , with  $A = (h \Delta n \pi / \lambda) \sqrt{h/\pi}$ , and  $B = h[1 - (h^2/6)]$ . The realm of this polarization-interferometer method is, particularly, the diffusion of polymer solns.; elimination of intermol. interaction effects calls for very high dilns. at which the usual refractometric methods become impractical. Examples of detns. of  $D$  in highly dil. soln. (against the pure solvent) for

low-mol. compds. are: sucrose 0.06% in  $H_2O$ , at  $22^\circ$ ,  $D = (4.78 \pm 0.08) \times 10^{-4}$  sq. cm./sec.;  $\beta$ -naphthol 0.01% in  $C_{10}H_8$ , at  $22^\circ$ ,  $D = (1.31 \pm 0.07) \times 10^{-4}$ ; for high polymers, polydivinylstyrene ( $M = 56,000$ ) 0.2% in  $C_{10}H_8$ , at  $22.8^\circ$ ,  $D = (2.8 \pm 0.16) \times 10^{-4}$ ; polydivinylstyrene ( $M = 256,000$ ) 0.06% or 0.147% in  $C_{10}H_8$ , at  $20^\circ$ ,  $D = (1.6 \pm 0.1) \times 10^{-4}$  (no variation with the concn.); polystyrene ( $M = 700,000$ ) 0.1% in  $C_{10}H_8$ , at  $22^\circ$ ,  $D = (5.3 \pm 0.4) \times 10^{-5}$ . The decrease of  $D$  with increasing mol. wt.  $M$  is unmistakable. However,  $D$  decreases much more slowly than  $M$  increases; this indicates that the polymer in soln. is not completely "permeable" to the solvent but possesses some degree of "opacity."  
N. Thon

TSVETKOV, V. N.

E. V. Frisman and V. N. Tsvetkov. Dynamic double refraction of liquids with chain molecules. P. 622.

The A. A. Zhdanov  
Leningrad State University  
Institute of Physics  
April 19, 1950

SO: Journal of Physical Chemistry, Vol. XXV, No. 6, June 1951

TSVETKOV, V.

USSR/Physics - Molecular Physics

21 May 51

"Method for Determining the Geometrical Dimensions of Macromolecules in Solution," V. Tsvetkov, Inst of High-Mol Comps, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol LXXVIII, No 3, pp 465-468

Tsvetkov attempts to improve the familiar deficient methods. He suggests sizes of mols in same solvent be found by measuring const of progressive diffusion  $D_t$  and const of rotational diffusion  $D_r$ , as related by  $D_t = kT/F$  and  $D_r = kT/M$  (where  $k$  = Boltzmann's const  $T$  = abs temp,  $F$  = coeff of progressive friction, and  $M$  = coeff of rotational friction). Submitted by Acad A. A. Lebedev 19 Mar 51

186T106

TSVETKOV, V. N.

"Optical Methods of Studying the Mobility and Form of Macromolecules in Solution" (Opticheskiye metody izucheniya podvizhnosti i formy makromolekul v rastvore) from the book Trudy of the Third All-Union Conference on Colloid Chemistry, pp. 380-390, Iz. AN SSSR, Moscow, 1956

(Report given at above Conference, Minsk, 21-4 Dec 53)

Author: Institute of High Molecular Compounds AS USSR

TSVETKOV, V. N.

184T110

USSR/Physics - Molecules, Size of 21 Jun 51

"Ramification and the Geometric Dimensions of Chain Molecules in Solution," V. N. Tsvetkov, Inst of High-Mol Compds, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol LXXVIII, No 6, pp 1123-1126

Shows for branching structures the quantity  $\overline{r^2}$  depends essentially upon deg of ramification, where  $\overline{r^2}$  is the mean sq radius of mol. Cf. P. Debye, "Jour Chem Phys" 14, 636, 1946; P. J. Flory, "Jour Am Chem Soc" 63, 3083, 1941. Submitted 17 Apr 51 by Acad A. A. Lebedev.

184T110





**"APPROVED FOR RELEASE: 04/03/2001**

**CIA-RDP86-00513R001757220010-6**

**APPROVED FOR RELEASE: 04/03/2001**

**CIA-RDP86-00513R001757220010-6"**

USSR .

539.133 : 535.515

475. Dynamic double refraction and the geometrical dimensions of macromolecules in solution. E. V. FRISMAN AND V. N. TSVETKOV. *Zh. eksper. teor. Fiz.*, 23, No. 6 (12) 690-702 (1952) *In Russian.*

The method of double refraction in a flow was used to study the structure of macromolecules in solution. A new universal type of dynamo-optimeter was developed, the construction of which is such that it is possible to obtain a laminar flow using an internal and an external rotor. It was established experimentally that the apparatus can be used for liquids of low viscosity within a wide range of velocity gradients under conditions of laminar flow. The dynamic double refraction of solutions of polystyrene in toluene and in butanone (methyl ethyl ketone) was investigated. The coefficients of the rotational diffusion of macromolecules were determined. The radii, the degree of transparency and the degree of coagulation of macromolecules in solution were determined by a comparison of the data obtained with the values of progressive diffusion for the same solutions. The possibility was shown of determining the molecular weight of a polymer from the measurements of the orientation angle of the dynamic double refraction of its solutions.

AB

E. HARKIN

124

TSVETKOV, V.N., KROZER, S.P., and TEREENT'YEVA, L. S.

"Dependence on Concentration of the Velocity of Diffusion of Certain Polymers in Solution," Dokl. AN SSSR, 85, No.2, pp 313-6, 1952  
Inst. of High Molecular Compounds, AS USSR

Results of investigation into the dependence, on concn, of the coefficient of diffusion of certain nonfractionated forms that differ considerably in molecular wts, e.g., polyisobutylene in hexane, polyvinyl in water, etc. Presented by Acad A.N.Terenin 19 May 52. 252T90

(PA 56 no. 671:7499 '53)

TSVETKOV, V. N.

1 Jan 53

USSR/Physics - Polystyrene

Diffusion of Fractions of Polystyrene in Dichloroethane," V. N. Tsvetkov and S. I. Klenin, Inst of High Mol Compds, Acad Sci USSR

DAN SSSR, Vol 88, No 1, pp 49-52

Investigate sample of polystyrene obtained by block polymerization of monomer at temp of 60°. The sample was fractionated and mol wt of fractions computed (see Outer, Carr, Zimm, J. Chem Phys, 18, 830 (1950)). Results showed that radii of spheres hydrodynamically equivalent to mol globule are proportional to square roots of mass of macromol, computed from light scattering. Received 16 Oct 52.

262T76

TSVETKOV, V. N.

259T95

USSR/Physics - Ultrasonic Absorption

21 Apr 53

"Absorption of Ultrasonic Waves in Certain Viscous Fluids," I.G. Mikhaylov

DAN SSSR, Vol 89, No 6, pp 991-993

Preliminary results of measurement of absorption of ultrasonic waves in refined cottonseed, tung, and castor oil, in which volumetric viscosity plays a small role. Acknowledges participation of V. S. Vasil'yeva and T.A. Kompaneyskaya in the work. Cites related works of V. N. Tsvetkov and V. Ye. Eskin (DAN SSSR, Vol 67, No 2, 1949), who investigated orientational relaxation in castor oil by method of acoustic birefringence. Presented by Acad A. N. Terenin 2 Feb 53.

259T95

TSVETKOV, V.N.; MAGARIK, S.Ya.

Dynamoöptimeter of high resolving power. Vest.Len.un. 9 no.8:163-168  
Ag '54. (MIRA 8:7)

(Diffusion) (Molecular rotation)

Tsvetkov, V. N.

Investigation of solutions of linear polymers by the light-dispersion method (Tyndall effect). I. General introduction. K. Z. Fattakhov, V. N. Tsvetkov, and G. V. Kallistov. *Zhur. Eksp. i Prikl. Khim.* 26, 315 (1953).

Theoretical and math. The dimensions and masses of polymer mol. in soln. are detd. by a study of the asymmetry of the dispersion of light by the soln. and of the intensity of the dispersed light at an angle of  $90^\circ$  to the incident beam. Corrections of the measured asymmetry are made by correcting for the dispersion caused by the solvent itself. For the case of polydisperse samples, the mol. wts. as detd. by the light-dispersion method are mean mol. wts. II. Molecular weights and dimensions of molecules of polymethyl methacrylate in acetone solution. *Ibid.* 351-61.—Exptl. studies of the asymmetry of the dispersion of light by solns. of polymethyl methacrylate fractions in acetone and in benzene were made over a wide range of mol. wts.  $M$  and concns. The 13 fractions studied yielded, by extrapolation to infinite diln., mol. wts. ranging from  $0.07$  to  $0.35 \times 10^6$  in acetone and  $0.25$  to  $7.85 \times 10^6$  in benzene. The formula  $[\eta] = 0.408 \times 10^{-4} M^{0.71}$  gives the relation between the specific characteristic viscosity of a fraction of polymethyl methacrylate in benzene and  $M$ . The relation between the length of a polymer mol. in soln. and in the isolated state is  $\bar{h}^2 = \bar{h}_0^2 \alpha^2$  where  $\alpha^2 = \alpha^2 = 2C_0 A_2 \bar{V}_1 d_2^2 M^{1/2}$ , so that  $\alpha = \sqrt{2C_0 A_2 \bar{V}_1 d_2^2 M^{1/2}}$ . App. and extd. relations are illustrated.  $\bar{V}_1$  is molar vol. of the solvent and  $d_2$  is the d. of the polymer.

Franz H. Rathmann

FD-1369

USSR/Physics - Polymers

Card 1/1 : Pub. 146-14/18

Author : Tsvetkov, V. N.; Fattakhov, K. Z.; and Kallistov, O. V.

Title : ~~Investigation of~~ solutions of linear polymers by the method of light scattering. II  
Molecular weights and dimensions of molecules of polymethyl metacrylate in acetone

Periodical : Zhur. eksp. i teor. fiz., 26, 351-361, Mar 1954

Abstract : The authors present the experimental investigations into light scattering by solutions containing fractions of polymethyl metacrylate in acetone for a wide range of molecular weights. For the studied fractions they determine the molecular weights and dimensions of the molecules. A formula is obtained which connects the characteristic viscosity of fractions of polymethyl metacrylate in benzol with their molecular weights. Thank E. S. Pisarenko for his help in fractioning and viscosimetric measurements. Seven references, 4 USSR (e.g. E. Frisman and K. Kiseleva; M. V. Vol'kenshteyn and O. B. Ptitsyn. 1951).

Institution : Institute of High-Molecular Compounds, Academy of Sciences USSR

Submitted : April 16, 1953



TSVETKOV, V. V.

USSR/Physical Chemistry

Card 1/1

Authors : Tsvetkov, V. N., and Terentyeva, L. S.

Title : Diffusion of polystyrene fractions in toluene

Periodical : Dokl. AN SSSR, 96, Ed. 2. 323 - 326, May 1954

Abstract : Study was made to determine the concentration relation of diffusion of various polystyrene fractions in toluene. Molecular weights of the fractions were determined from viscosimetric measurements in toluene in accordance with formulas (4,5) for the characteristic viscosity  $\eta$ :

$$[\eta] = 1.6 - 10^{-4} \cdot M^{0.69}$$

The obtained values  $\eta$  and M are given in table. The method of measuring the rate of diffusion was no different from the one used by other authors. Twelve references; 6 USSR since 1945. Table, graphs.

Institution : Academy of Sciences USSR, Institute of Highmolecular Compounds

Presented by : Academician A. A. Lebedev, March 4, 1954

Tsvetkov, V. N.

~~Optical methods for investigating the structure of macromolecules in solution. V. N. Tsvetkov (Inst. vysokomolekulyarnykh fizicheskikh i khimicheskikh, Akad. Nauk S.S.S.R., Leningrad). (Chem. Zvesty 49, 1410-32(1955).—A lecture. Exptl. and theoretical work by T. on the structure and phys. properties of macromols. (diffusion coeffs., low birefringence) is reviewed and discussed. The exptl. results agree better with the theory of anisotropic spheres than with the theory of viscoelastic spheres. B. Erdős~~

TSYETKOV, V. N.

USSR/Chemistry of High-Molecular Substances, F

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 61705

Author: ~~Tsyetkov, V. N.~~, Savvon, S. M.

Institution: None

Title: Dynamic Double Refraction in Solutions of Fractions of High-Molecular Polystyrene

Original

Periodical: Zh. tekhn. fiziki, 1956, 26, No 2, 348-358

Abstract: By means of the universal dynamo-optimeter an investigation was made of dynamic double refraction of solutions of polystyrene (I) fractions, in benzene, over the molecular weight M interval from one to  $5 \cdot 10^6$ . The results thus obtained are in full agreement with the previously secured data (Referat Zhur - Khimiya, 1956, 16288) relating to toluene solutions of I having lower M. Characteristic values (with zero gradients and concentrations) of angles of orientation and double refraction increase monotonously with M of the samples in quantitative agreement with the orientation theory of Maxwell's effect.

Card 1/1

TSVETKOV, V. N.

USSR/Chemistry of High-Molecular Substances, F

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 61704

Author: Frisman, E. V., Tsvetkov, V. N.

Institution: None

Title: Deformation of Macromolecules in Flow and Its Influence Upon the Sign of Dynamic Double Refraction of the Polymer Solution

Original  
Periodical: Dokl. AN SSSR, 1956, 106, No 1, 42-45

Abstract: From the theory of the effect of shape in dynamic double refraction of solutions of polymers, previously proposed by the authors (Referat Zhur - Khimiya, 1955, 39899), it follows that the role of this effect increases with molecular weight  $M$  of the polymer. Therefore in a solution of polystyrene (I), for which the internal anisotropy is negative and the shape anisotropy is positive, the sign of dynamic double refraction  $\Delta n$  can depend on  $M$ . To verify this an investigation was made of dynamic double refraction of the solutions of 2 fractions I ( $M \approx 3 \cdot 10^5$  and  $8 \cdot 10^6$ ) in dioxane (difference

Card 1/2

USSR/Chemistry of High-Molecular Substances, F

Abst Journal: Referat Zhur - Khimiya, No 19, 1956, 61704

Abstract: in the refraction indexes of dry I and of the solvent is 0.18). With the first fraction  $\Delta n$  increases linearly with increase in velocity gradient  $g$  and has a negative sign. With the second fraction  $\Delta n$  is positive and increases in proportion to  $g$  when  $g$  is small, but on further increase in  $g$  the  $\Delta n$  passes through a maximum and then becomes negative. The authors attribute the change in sign of  $\Delta n$  to the occurrence of a negative photo-elastic effect, the role of which increases with increase in  $g$ . With small  $g$  the essential part is played by the shape effect which indicates an asymmetry in the shape of macromolecule. The ratio of dynamo-optical constant  $[\eta]$  to characteristic viscosity  $[\eta]$  depends sharply upon  $M$ : for the 2 fractions  $[\eta]/[\eta]$  is respectively  $-1.86 \cdot 10^{-10}$  and  $+23 \cdot 10^{-10}$ .

Card 2/2

TSVETKOV, V.N.; SAVVON, S.M.

Dynamic birefringence in solutions of high-molecular polystyrene  
fractions. Zhur.tekh.fiz.26 no.2:348-358 F '56. (MLRA 9:6)  
(Styrene--Optical properties)

TSVETKOV, V.N.; KOTLYAR, S.Ya.

Investigation of polyvinyl acetate solutions by the light scattering method [with English summary in insert]. Zhur.fiz.khim.30 no.5:1100-1103 My '56. (MLRA 9:9)

1.Akademiya nauk SSSR, Institut vysokomolekulyarnykh soedineniy, Leningrad.  
(Light--Scattering) (Acetic acid)

Tsvetkov, V. N.

USSR/ Physics - Optics

Card 1/1 Pub. 22 - 11/48

Authors : Frisman, E. V. and Tsvetkov, V. N.

Title : Deformation of macromolecules in a flow and its influence on the sign of the dynamic birefringence of a polymer solution

Periodical : Dok. AN SSSR 106/1, 42-45, Jan 1, 1956

Abstract : A new hypothesis concerning the birefringence of polymer solutions is expressed. It indicates, that the optical behavior of a macromolecule of a polymer solution depends not only on the natural anisotropy of the molecule, as it has been stated by the statistical theory, but also on the anisotropy of the molecule's shape. Experiments, conducted for the purpose of proving the correctness of the hypothesis, are described. Thirteen references: 5 USSR, 5 Germ., 1 USA and 2 Swiss (1873-1955). Graphs.

Institution : Leningrad State University imeni A. A. Zhdanov

Presented by: Academician A. A. Lebedev, August 9, 1955



TSVETKOV, V. H., and KALISTOV, O. V.

"Viscosity dependence on shear rate," a paper presented at the 9th Congress on the Chemistry and Physics of High Polymers, 28 Jan-2 Feb 57, Moscow, Polymer Research Inst.

B-3,004,395

TSVETKOV, V. N., Leningrad State University

"A Study of the Diffusion in Polymer Solutions by the Use of the Polarization Interferometer," a paper submitted at the International Symposium on Macromolecular Chemistry, 9-15 Sep 1957, Prague.

TSVETROV, V. H., KALISTOV, O. V., ALDOUSHIN, V. G., and ESKIN, V. E.

"Some problems in the light scattering of solutions," a paper  
presented at the 9th Congress on the Chemistry and Physics of High Polymers,  
20 Jan-2 Feb 57, Moscow, Polymer Research Inst.

B-3,084,395

TSVETKOV, V.M.

Modern methods of determining the form of macromolecules in solutions.  
Usp. khim. i tekhn. polim. no. 2:171-190 '57. (MIRA 11:1)  
(Solutions (Chemistry)) (Macromolecular compounds)  
(Molecular structure)

AUTHORS:

~~Tsvetkov, V. N., Magarik, S. Ya.~~  
Tsvetkov, V. N., Magarik, S. Ya.

20-5-17/54

TITLE:

The Optical Anisotropy of Some Chain-Like Molecules Which Contain Benzene Rings (Opticheskaya anizotropiya nekotorykh tsepnykh molekul, sodержashchikh benzol'nyye kol'tsa).

PERIODICAL:

Doklady Akademii Nauk SSSR, 1957, Vol. 115, Nr 5, pp. 911-914 (USSR)

ABSTRACT:

The difference of polarizability of a monomeric term (in the direction of the chain of the main valences and in the direction opposite to it) with respect to the sign agrees with the anisotropy of the segment. The present paper makes use of this fact for the comparative study of the structure of the polymeric chains which contain benzene rings. The following 4 polymers were investigated: polystirol ( $P_1$ ), poly-n-tetra-butyl-phenylmetacrylate ( $P_2$ ), poly-1,4-diisopropenyl-benzene ( $P_3$ ) and diisopropenyldiphenylethane ( $P_4$ ). All these polymers were not fractionated. For the purpose of determining both main polarizabilities  $\alpha_1$  and  $\alpha_2$  of a

CARD 1/3

The Optical Anisotropy of Some Chain-Like Molecules  
Which Contain Benzene Rings

20-5-17/54

segment of the chain dynamo-optical and viscosimmetrical measurements were undertaken on the polymers in such solvents as exclude the form effect. Chlorine benzene was used as a solvent for  $P_2$  and "bromoform" for the three other polymers. The dynamical double refraction of rays was investigated in a dynamometer with an internal rotor. The dependence of the double ray refraction upon the velocity gradients determined in this way is here shown in figures for the mentioned polymers. The difference  $(\alpha_1 - \alpha_2)$  is a large positive quantity for  $P_3$  and  $P_4$  and for  $P_1$  and  $P_2$  a large negative quantity. On the basis of a structural scheme given here the anisotropy of the monomer term can be computed in the investigated polymers. The corresponding results are given in a table. The differences of the polarizabilities of the terms of the chain  $\beta_1 - \beta_2$  found here have the same sign in all cases as that of the experimental values of  $\alpha_1 - \alpha_2$  and they also have reasonable absolute values. There are 4 figures,

CARD 2/3

The Optical Anisotropy of Some Chain-like Molecules  
Which Contain Benzene Rings

20-5-17/54

1 table and 7 references, 3 of which are Slavic.

PRESENTED: By A. A. Lebedev, Academician, February 19, 1957

SUBMITTED: February 19, 1957

AVAILABLE: Library of Congress

CARD 3/3

FRISMAN, E. V. and TSVETKOV, V. H.

(The Physical Institute of the University of Leningrad, Leningrad, USSR)

"The Effect of Shape in Streaming Birefringence of Polymer Solutions,"  
paper submitted at Soviet High-Polymers, Intl. Conference, Nottingham,  
Uk, 21-24 July 1958.

E-3,109,661



AUTHORS: Tsvetkov, V. N., Aleksandrova, Ye. M. SOV/64-58-5-5/21

TITLE: The Coagulation of Polystyrene Latex in Mechanical Mixing  
(Koagulyatsiya polistirol'nogo lateksa pri mekhanicheskom  
peremeshivanii)

PERIODICAL: Khimicheskaya promyshlennost', 1958, Nr 5, pp.280 - 284 (USSR)

ABSTRACT: From the study of the rheological properties of gels in  
castor-oil soap as a stabilizer in polystyrene latex the  
possibility of an electrolyte-less coagulation by mechanical  
destruction of the stabilizer's adsorption layers on the solid  
latex particles was assumed. Since Peskov (Ref 8) had already  
mentioned coagulation investigations without electrolyte  
effect the authors of the present article carried out experiments  
with different amounts of castor-oil soaps (castor-oil soaps  
KM), with 0,4 to 1,2 parts by weight being used for the stabili-  
zation, and with the latex being correspondingly termed KM-0,4  
KM-1,2 etc. An apparatus with a plane disk mixer was used and  
the end of coagulation was determined according to the viscosity  
of the latex. According to Maron and Bowler (Maron i Bouler)  
(Ref 9) a heated latex needs more electrolyte for the coagulation

Card 1/3

The Coagulation of Polystyrene Latex in Mechanical  
Mixing

SOV/64-58-5-5/21

than one which is not heated; the latex KM-1,2 showed a maximum stability at 8-12°. In connection with the observations made by Freundlich (Freyndlikh)(Ref 10) and Müller (Myuller) (Ref 11) the authors carried out experiments on various influences on the coagulation of latex and stated that an increase of the latex concentration as well as of the rotational speed of the stirrer increase the rate of coagulation so that in the formation of the polymer a partial coagulation begins. It was found that the addition of a polymer coagulate in the coagulation process exerts an autocatalytic effect on the course of coagulation. The experimental results in the investigation of the relative resistances of the adsorption layer with the addition of a stabilizer and a subsequent mechanical coagulation were in agreement with those obtained by Rebinder and Trapeznikov (Ref 13), as Heller (Geller)(Ref 14), and Yurzhenko and Gusyakov(Ref 15). According to their resistance the anions may be arranged in the following order: sodium oleate > sodium stearate > n-octylnaphthalene-sulfo acid-sodium > sodium ricinoleate. There are 8 figures and 16 references, 9 of which are Soviet.

Card 2/3

TSVETKOV, V. N.; LIPATOV, S. M.; KARGIN, V. A.;

"Polymers, their solutions and semi-colloids."

report presented at the Fourth All-Union Conference on Colloidal Chemistry,  
Tbilisi, Georgian SSR, 12-16 May 1958 (Koll zhur, 20,5, p.677-9, '58, Taubman, A.B)

10 VERTICALLY

**AUTHORS:** Tsvetkov, V. I., Verkhovina, L. N.

27-1-1-1/5=

**TITLE:** Photoelastic Effect in Methylmethacrylate and Poly-p-Tertiar, Butylphenylmethacrylate Polymers and Their Copolymers (Fotoelasticheskiy effekt v polimerakh metilmetakrilata, poli-p-tretnogo-butilfenilmetakrilata i v ikh sopolinakh).

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1958, Vol. 28, Nr 1, pp. 97-108 (USSR)

ABSTRACT: The elasticity of the side groups of the macromolecule was investigated by means of an object which has the structure of the basic chain (similar to the structure of the poly-methyl-methacrylate=PMMA) but which has an essentially heavier and much more anisotropic ether group than the  $\text{COOCH}_3$  group of the methyl-methacrylate. As this object poly-p-tertiary butylphenylmethacrylate (PPTBPMMA) was chosen. It has a side ether group with the  $\text{COOC}_6\text{H}_4\text{C}(\text{CH}_3)_3$ -structure. The thermal resistant samples of the PPTBPMMA and of its polymers were obtained from the laboratory of Professor L. M. Koton at the Institute for High-Molecular Compounds. The temperature course of the photoelastic effect of PMMA as well as of PPTBPMMA, and of their copolymers were investigated. The temperature dependence  $E$  of PMMA corresponded with that earlier observed. Immediately above the vitrification temperature the effect is negative, changes its sign and becomes positive at high temperatures. PPTBPMMA shows, in pure form as well as in form of co-

Card 1/2

Photoelastic Effect in Methylmethacrylate and Poly-*p*-Tertiary Butylphenylmethacrylate Polymers and Their Copolymers. 57-1-14/50

polymers in highly elastic state a photoelastic effect. The calculation of the polarizability difference for the segment  $\alpha_1$ - $\alpha_2$  of PPTBMA according to the additive property scheme for the components leads to  $\alpha_1$ - $\alpha_2$  values which are close to those of pure polymers;  $\alpha_1$  and  $\alpha_2$  are the polarizabilities of the static segment of the molecular chain in the direction of its length, resp. in the direction vertical to it. Using the known data on the polarizability the main polarizability of the monomeric members of PMMA and PPTBMA for a "link" model of the basic chain and under different conditions for the elasticity of the side chains is calculated. The authors show that the positive photoelastic effect in PMMA can only be understood if a practically complete freedom of rotation around the C-C- and C-O- connections in the ester group are assumed. On the other hand the negative double ray diffraction in PPTBMA shows that in its molecule these rotations are practically slowed down. This can be attributed to the interaction of the substituents in the carbon atoms separated by the heavy methylene group. There are 11 figures, 3 tables, and 5 references, 6 of which are Slavic.

ASSOCIATION: Institute for High-Molecular Compounds AS USSR, Leningrad (Institut vysokomolekulyarnykh soyedineniy AN SSSR, Leningrad).

SUBMITTED: February 23, 1957

AVAILABLE: Library of Congress  
Card 2/2

57-28-5-18/36

AUTHORS: Tsvetkov, V. N., Klenin, S. I.

TITLE: Diffusion and Viscosity of Solutions of Polymethylmetacrylate and of Polyparatertiary Butylphenylmetacrylate (Diffuziya i vyazkost' rastvorov polimetilmetakrilata i poliparatretichnogo butilfenilmetakrilata)

PERIODICAL: Zhurnal Tekhnichskoy Fiziki, 1958, Vol. 28, Nr 5, pp. 1019-1028 (USSR)

ABSTRACT: The diffusion velocity of polymers in diluted solution represents one of the immediate characteristics of its molecular size. Therefore it is possible to pass a judgement on the structure of its macromolecules from the determination of the diffusion coefficient of the polymer in the solution. In the present paper the authors applied this method to the comparative examination of the properties of polymethylmetacrylate (PMMA) and of polyparatertiary butylphenylmetacrylate (PBPHMA). These compounds represent polymers with identical chain structure of the basic valence, however, with a different size and structure of the molecular side groups. The dependence of the characteristic viscosities[?] and of the diffusion coefficients D on the molecular weight of the fraction was given for two

Card 1/4

Diffusion and Viscosity of Solutions of Polymethylmetacrylate and of Polyparateritary Butylphenylmetacrylate 57-28-5-18/36

investigated polymers in a logarithmic scale (figures 9 and 10). These points coincide with the straight lines corresponding to the following functions. For PMMA in chloroform holds:

$$[\eta] = 5.1 \cdot 10^{-5} \cdot M^{0.79} \quad D = 4.5 \cdot 10^{-4} \cdot M^{-0.60}$$

and for PBPHMA in chloroform

$$[\eta] = 2.4 \cdot 10^{-5} \cdot M^{0.78} \quad D = 6.0 \cdot 10^{-4} \cdot M^{-0.60}$$

As is known, a universal interrelation exists between the diffusion coefficient  $D$  and the characteristic viscosity  $[\eta]$  of the polymer fraction in the corresponding solvent, (Refs 8 and 9). If the hydrodynamical properties of the molecular tangle in the solution is ascribed by means of equivalent, semi-transparent spheres, as it is done in the theory by Debye-Bueche (Ref 13), the ratio between the hydrodynamical molecular radius from the viscosity  $R_\eta$  and the radius from diffusion  $R_D$  is

$$\frac{R_\eta}{R_D} = \frac{6\pi}{k} \left( \frac{30}{\pi N} \right)^{1/3} \left\{ \eta_0 D (M[\eta])^{4/3} T^{-1} \right\}^{1/2} (\sigma) \left( \frac{2.5}{\varphi(\sigma)} \right)^{1/3}$$

Card 2/4

Hence, the quantity  $A = \eta_0 D T^{-1} (M[\eta])^{4/3}$  differs from the ratio

Diffusion and Viscosity of Solutions of Polymethylmetacrylate and of Polyparatertiary Butylphenylmetacrylate 57-28-5-18/36

$\frac{R\eta}{R_D}$  only by the numerical multiplicand. The theory by Flory shows analogous results (Ref 14). Experiments show that the quantity  $A$  proportional to the ratio  $R\eta/R_D$  represents a universal constant, its most probable value being  $A=3.44 \cdot 10^{-10}$  erg. The proportion of the viscosity- and hydrodynamic diffusion radii permits to immediately obtain the interrelation between the size of the macromolecules and the diffusion coefficient. Summary: In this paper a device for the measurement of the diffusion coefficient in solutions is described. It is based upon the application of the polarization interferometer! The diffusion and the viscosity of the solutions of polymethylmetacrylate and of polybutylphenylmetacrylate in the wide interval of the molecular balance was investigated. A simple relation was obtained, which permits to determine the size of the macromolecules in the solution according to the measured diffusion coefficients. The experimental results permit to conclude that rotation in the chains of polybutylphenylmetacrylate is more impeded than is the case in the chains of polymethylmetacrylate. There are 13 figures, 3 tables, and 14 references, 10 of which are Soviet.

Card 3/4



Diffusion and Viscosity of Solutions of Polymethylmetacrylate 57-28-5-18/36  
and of Polyparatertiary Butylphenylmetacrylate.

ASSOCIATION: Institut vysokomolekulyarnykh soedineniy AN SSSR, Leningrad  
(Leningrad, Institute for High-Molecular Compounds, AS USSR)

SUBMITTED: July 23, 1957

1. Polymers--Diffusion 2. Polymers--Viscosity

Card 4/4

307/ 57-2-7-11/35

AUTHORS: Tsvetkov, V. N., Frisman, E. V., Ptitsyn, O. B.,  
Kotlyar, S. Ya.

TITLE: The Shape Effect in the Dynamic Double Refraction of Polymer  
Solutions (Effekt formy v dinamicheskom dvoynom lucheprelom-  
lenii rastvorov polimerov)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1958, Vol. 28, Nr 7, pp.1428-1436  
(USSR)

ABSTRACT: The authors suggest a theory of the shape effect in the dynamic  
double refraction of polymer solutions. The taking into ac-  
count of the shape effect in the theory of dynamic double re-  
fraction is suggested on the basis of the model by Tsvetkov  
and Frisman (Ref 9). According to this model the macromole-  
cule in a solution is regarded as an ellipsoidal macroscopic  
particle saturated with the solvent. The refraction index  
of such a particle is different from the refraction index  
of the solvent. Thus the particle does not only have an in-  
trinsic anisotropy but also an anisotropy of shape. The lat-  
ter can be calculated according to the known formula by  
Maxwell (Refs 10 and 11) concerning the anisotropy of the

Card 1/3

SOV/57-29-7-11/35  
The Shape Effect in the Dynamic Double Refraction of Polymer Solutions

shape of macroscopic particles. It is shown that in the case of small velocity gradients the shape effect increases proportionally to the gradient, while in the case of great gradients it tends toward a constant value. The theory given expresses well the experimental data and in particular case; also the earlier-found dependence of the sign of the double refraction of a solution of polystyrene in dioxane on the velocity gradient. Finally the authors refer to the works by M. Čopič (Refs 17 and 18) and they show that in spite of the great difference in the models used and in spite of a number of assumptions in either theory they coincide well (viz. this theory and that by Čopič). There are 2 figures, 2 tables, and 18 references, 8 of which are Soviet.

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniy AN SSSR (Institute of High Molecular Compounds, AS USSR)  
Leningradskiy gosudarstvennyy universitet im. A. A. Zhdanova  
(Leningrad State University imeni A. A. Zhdanov)

SUBMITTED: May 11, 1957  
Card 2/3

The Shape Effect in the Dynamic Double  
Refraction of Polymer Solutions

SOV/57-23-7-11/55

1. Polymer solutions--Refraction

Card 5/3

5.7/57-23-7-14/35

AUTHORS: Tavetkov, V. N., Krozer, S. P.

TITLE: On Some Pre-Transition Phenomena in p-Azoxyanisole Near the Point of Transformation (O nekoterykh prädperakhodnykh yavleniyakh v p-azoksianizole vblizi tochki prevrashcheniya)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1958, Vol. 28, Nr 7, pp.1444-1447 (USSR)

ABSTRACT: In connection with the strong double refraction in the isotropic phase of the flow the presence of an anomalous effect in the ultrasonic field was to be expected, as the double acoustic refraction in the liquid can be regarded as a dynamo-optical effect with a velocity gradient dependent on time. The experimental checking of the theoretical conclusions was carried out (Refs 9 and 12). The effect mentioned was found and investigated by the authors. Besides, the authors observed an anomalously strong absorption of ultrasound (all experiments were carried out from 1948 - 1950). For the investigation of this phenomenon an apparatus with a generator using a [K] 1000 valve operating in a three-point circuit

Card 1/3

SOV57-23-7-14/35

On Some Pre-Transition Phenomena in p-Azoxyanisole Near the Point of Transformation

was constructed. The description of the apparatus and of the experiment follow. From the data obtained this way the absorption factor was then determined according to formula (2). The magnitude B is proportional to the constant of double refraction  $k$ , and was determined according to formula (3). Furthermore, follows

$$B \sim M \frac{1}{1 + \omega^2 \tau^2}$$

where M denotes the Maxwell constant,  $\omega$  the angular frequency and  $\tau$  the relaxation time. The intensity of ultrasound I at the place where a double refraction was observed was determined according to formula (2). From the last-mentioned formula the relaxation time can be determined. The results obtained this way are similar to the results of the measurement of ultrasound absorption (Ref 13). The experiment discussed does not permit to find the exact temperature dependence at  $\tau$ . Nevertheless the following may be assumed: The relaxation phenomena observed in absorption and double refraction are of similar nature. It would be natural to assume that the relaxation time was proportional to the particle volume. A comparison of the results (Ref 4) with

Card 2/3

On Some Pre-Transition Phenomena in p-Azoxyanisole Near the Point of Transformation

SOV/57-23-7-14/35

the curve obtained by this experiment shows a good coincidence which again points to the similar character of the mechanisms. There are 3 figures, 1 table, and 15 references, 8 of which are Soviet.

ASSOCIATION: Fizicheskiy institut Leningradskogo gosudarstvennogo universiteta im. A. A. Zhdanova  
(Institute of Physics at the Leningrad State University imeni A. A. Zhdanov)

SUBMITTED: April 29, 1957

1. Cyclic compounds--Acoustic properties    2. Ultrasonic radiation  
--Absorption

Card 3/3

V.A. Isvetkov

Report Given

5(0)

ABSTRACT:

TITLE:

PERIODICAL:

ABSTRACT:

307/62-59-3-36/37

General Meetings of the Department of Chemical Sciences of the Academy of Sciences, USSR on October 23 and November 27-28, 1958 (Obshchiye sobraniya Otdel'nykh khimicheskikh nauk Akademii nauk SSSR 23 oktyabrya i 27-28 noyabrya 1958 g.)

Investitsiya Akademii nauk SSSR. Otdel'nyye khimicheskikh nauk, 1959, Nr 3, pp 564-566 (USSR)

This is a report on the General Meetings of the Department of Chemical Sciences, AS USSR, on October 23, 1958 and November 27-28, 1958. The Department of Chemical Sciences of the Academy of Sciences took place under the chairmanship of Academician N. N. Semakova. A. L. Kuznetsov delivered a lecture on the "Investigations in the Field of Tellurium Chemistry". The emphasis in the course of the last years has considerably increased in the properties of tellurium and numerous tellurides. In her lecture Semakova reported on the production of pure tellurium, on the investigations of the behavior of admixtures and on investigations of numerous tellurides. The lecturer was asked numerous questions. N. A. Poray-Koshits, Candidate of Physical and Mathematical Sciences spoke on the "Stereochemistry of Complex Compounds of Bivalent Nickel". On the basis of direct X-ray structural analyses carried out at the Institute of Chemistry and Metallurgy of Rare Metals (Institute of General and Inorganic Chemistry, AS USSR) and the MGU it was found that all ammonia thioacetate compounds of nickel which are separated from the solution at different concentrations represent different structural character, crystalline structures, compounds. The analysis of the crystallochemical rules in the series of nickel thioacetate compounds, G. B. Bokiy and S. Z. Roginskii, Corresponding Member, AS USSR, took part in the discussion. M. Z. Ginzburg, Doctor of Chemical Sciences spoke on the "Application of High Pressure in the Investigation of the Transition Stage and the Mechanism of Reaction". By means of experimental data the lecturer proved that the application of high pressure opens new prospects in this field. S. Z. Roginskii, Corresponding Member, AS USSR, took part in the discussion. A. I. Kitaygorodskiy, Doctor of Chemical Sciences took part in the discussion. On the occasion of the general meeting held under the chairmanship of Academician A. P. Vinogradov from November 27 to 28, 1958 N. V. Fikits, Corresponding Member, AS USSR and G. A. Kaluzhnikovskiy, Candidate of Technical Sciences spoke on the "Properties of Low-substituted Cellulose Esters and Their Solutions". The following scientists took part in the discussion: S. F. Danilov, Corresponding Member, G. P. Golovinskiy, Candidate of Chemical Sciences, G. V. Samsonov, Doctor of Chemical Sciences, et al. "Specific Sorption of Ions of Organic Substances on the Surface of weakly swelling ion-exchange resins, which cause the sorb certain ions of organic substances allow the establishment of a new effective method of producing chemically pure streptomycin and penicillin. The lecturer was asked many questions. N. V. Vol'kenshteyn, Doctor of Physical and Mathematical Sciences dealt with the "Problems of Statistical Physics of the Polymer Chains". The lecturer and his colleagues have developed a general statistical method of computing the properties of macromolecules which is based on the application of the rotational isomer model. The following scientists took part in the discussion: V. I. Ivaev, Doctor of Chemical Sciences, B. V. Derzhagin and V. G. Levich, Corresponding Member, AS USSR, A. M. Tsvetkov, Doctor of Physical and Mathematical Sciences spoke on the "Intermolecular Interaction and the Role of Hydrogen Bonds in the Characterization of the Properties of Macromolecules in Solution". The lecturer demonstrated that the character of the interaction may be determined by a joint determination of the characteristic viscosity and diffusion. B. V. Derzhagin, Corresponding Member, AS USSR, M. V. Vol'kenshteyn, Doctor of Physical and Mathematical Sciences and A. I. Kitaygorodskiy, Doctor of Chemical Sciences took part in the discussion.

Card 1/4

Card 2/4

Card 3/4



ALEKSANDROVA, Ye. M.; TSVETKOV, V. N.; RAZUMIKHINA, N. S.

"Concerning Non-Electrolytic Coagulation of Polystirole Latexes."

report presented at the Section on Colloid Chemistry, VIII Mendeleev Conference of General and Applied Chemistry, Moscow, 16-23 March 1959.  
(Koll. Zhur. v. 21, No. 4, pp. 509-511)

15.7140 2109, 2209, 1460

85815  
S/081/60/000/019/005/012  
A006/AC01

Translation from: Referativnyy zhurnal, Khimiya, 1960, No. 19, pp. 515-516,  
# 79330

AUTHORS: Kamenskiy, I. V., Tsvetkov, V. N.

TITLE: Interaction of Phenol With Hexamethylene Tetramine. <sup>1</sup> Information 2.  
Preparation of Hexaphenol Resins in Aqueous and Aqueous-Alcoholic  
Media <sup>15</sup>

PERIODICAL: Tr. Mosk. khim-tekhnol. in-ta im. D. I. Mendeleyeva, 1959, No. 29,  
pp. 55-62

TEXT: The authors investigated the reaction of phenol (I) with hexamethylene tetramine (II) in a liquid medium. Resins were investigated, obtained at a different content of water in the initial mixture of I and II used at a 1 : 0.3 ratio. Optimum amount of water was 100 % with respect to I. The duration of resin formation is 29 - 30 min depending on the amount of water introduced, the Ubbelohde drop point is 111°C, hardening rate at 160°C is 87 sec, the content of nitrogen bound is 5%. Resins are described obtained in the presence of 0.1 - 3% KOH with respect to I. They are soluble in acetone, dioxane and alkalis and not

Card 1/2

85815

S/081/60/000/019/005/012  
A006/A001

Interaction of Phenol With Hexamethylene Tetramine. Information 2. Preparation of Hexaphenol Resins in Aqueous and Aqueous-Alcoholic Media

soluble in alcohol and aniline. Changes in the nitrogen content in resins during the process of their hardening are shown. To obtain resins soluble in alcohol, condensation of I with II in aqueous-alcoholic medium is performed. At 100% alcohol with respect to I the yield is 142 - 144% (with respect to I) hardening rate at 160°C is 100 sec, the content of nitrogen bound is 4.58%. The resins are soluble in 50% KOH solution, aniline, acetone and alcohol. Information I see RZhKhim, 1958, No. 10, # 34994. ✓

Ye. Zamtrovskaya

Translator's note: This is the full translation of the original Russian abstract.

Card 2/2

FRISMAN, M.V.; TSVETKOV, V.N.

Dynamic birefringence due to the shape of macromolecules in  
solution at different concentrations and shear stresses. Part 3.  
Zhur.tekh.fiz. 29 no.2:212-223 F '59. (MIRA 12:4)

1. Leningradskiy gosudarstvennyy universitet im. A.A.Zhdanova.  
(Styrene--Optical properties)

5(4)

SOV/76-33-3-32/41

AUTHORS:

Tsvetkov, V. N., Kallistov, O. V.

TITLE:

Light Dispersion and Viscosity of Solutions of the Fraction of Poly-para-tert-butyl-phenyl Methacrylate in Acetone  
(Svetorasseyaniye i vyazkost' rastvorov fraktsiy polipara-tretichnobutilfenilmetakrilata v atsetone)

PERIODICAL:

Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 3, pp 710-716  
(USSR)

ABSTRACT:

In the present case poly-para-tert-butyl-phenyl methacrylate (II) (Ref 2) was investigated by a method which was already applied to the determination of the size of macromolecules of polymethyl methacrylate (I) in acetone. The nephelometric measurements were made by means of a Pulfrich F device (Fig 1), while the viscosity was determined by means of a viscosimeter according to Oswald. The four sample fractions of (II) were obtained from acetone solutions by precipitation with methanol. From the diagram of  $\Delta n$  as a function of concentration  $c$  (Fig 2) (where  $\Delta n$  denotes the refractive indices of the solution and the solvent) the value

$H = 2.28 \cdot 10^{-7}$  was computed and diagrams of various functions

Card 1/3

SOV/76-33-3-32/41

Light Dispersion and Viscosity of Solutions of the Fraction of Poly-para-tert-butyl-phenyl Methacrylate in Acetone

( $Hc/R_{90}''$ ;  $1/(Z-1)$ ,  $\eta_{\text{spec}}/c$ ) of the concentration of the low- and high-molecular fractions of (II) are given (Figs 3-7). According to the data obtained a diagram of  $\lg[\eta]$  as a function of  $\lg \bar{M}_B$  (where  $\bar{M}_B$  denotes the average molecular weight) (Fig 8) and equation (4) were established, wherefrom the distribution curve of the molecular weight was plotted (Fig 9). The latter exhibits three maxima. From the thermodynamic point of view, acetone is a better solvent for (I) than for (II). The dependence of the radii

of gyration of macromolecules  $\sqrt{r_z^{-2}}$  on the square root of the polarization degree  $\sqrt{P}$  for the fractions of (I) and (II) is shown in figure 10. The authors state that with the same degree of polarization of (I) and (II) the dimensions of the macromolecules of (II) in acetone are larger than in the case of (I). The experimental results indicate a higher thermodynamic degree of the mobility of "undisturbed" molecule chains of (I), as compared to those of (II). The authors point to an interaction

Card 2/3

SOV/76-33-3-32/41

Light Dispersion and Viscosity of Solutions of the Fraction of Poly-para-tert-butyl-phenyl Methacrylate in Acetone

of the substituents on nonadjacent hydrocarbon atoms of the chain, which are separated by a methylene bond and usually are not taken into account in the statistical theory of polymer chains. There are 10 figures, 1 table, and 8 references, 5 of which are Soviet.

ASSOCIATION: Akademiya nauk SSSR, Institut vysomolekulyarnykh soyedineniy, Leningrad (Academy of Sciences USSR, Institute of High-molecular Compounds, Leningrad)

SUBMITTED: September 6, 1957

Card 3/3

30V/76-33-4-13/32

5(4), 15(8)

AUTHORS:

Magarik, S. Ya., Tsvetkov, V. N.

TITLE:

The Optical Anisotropy of Polymethylmethacrylate, Poly-para-tert-butylphenylmethacrylate and Their Copolymers (Opticheskaya anizotropiya polimetilmetakrilata, poli-p-tret-butilfenil-metakrilata i ikh sopolimerov)

PERIODICAL:

Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 4, pp 835-839 (USSR)

ABSTRACT:

In the present paper the method of dynamic double refraction of light in a flowing polymer solution is applied to the investigation of the optical anisotropy of the macromolecules. Polymethylmethacrylate (I) and poly-para-tert-butylphenylmethacrylate (II) were subjected to comparative determinations since they differ from one another only by their dimension and the anisotropy of the lateral ester groups. Benzene was used as solvent for (I) and according to measurements made by S. I. Klenin (by means of a polarization interferometer) the difference of the refraction indices between the solvent and the solution per concentration unit  $(n_1 - n_2)/C = 6.10^{-5}$ . (II) and its copolymers with (I) was investigated in chlorobenzene. The double refraction of light was investigated in a universal "dynamooptimeter" (Ref 3). The anisotropy of (I) is independent of the molecular weight in 5 different fractions with a 100-fold change of the

Card 1/2



SOV/76-33-4-13/32

The Optical Anisotropy of Polymethylmethacrylate, Poly-para-tert-butylphenyl-methacrylate and Their Copolymers

molecular weight (Table) and is  $(\alpha_1 - \alpha_2) = +3.9 \cdot 10^{-25} \text{ cm}^3$  which is a low value as compared e.g. with that of polystyrene. The results of parallel investigations of dynamic-optical and photo-elastic properties of the polymers are compared and it is found that in (I) the transition from the vitreous into the highly elastic state does not take place sharply (as is the case in many polymers) but slowly within a larger temperature range. In the case of (I) it may be assumed that a complete freedom of rotation exists around the bonds C-C and C-O in the lateral ester groups of the macromolecules. In the case of (II) a free rotation for the benzene ring and around the C-C bond was observed; the rotation around the C-O bond, however, is considerably inhibited. The latter is explained by the interaction of the heavy substituents (with aromatic cycle and the butyl group) at the end of the lateral groups. In conclusion M. G. Zhenevskaya is thanked for the preparation of the samples. There are 4 figures, 1 table, and 13 references, 10 of which are Soviet.

ASSOCIATION: Institut vysokomolekulyarnykh soedineniy, Leningrad  
(Institute of High-molecular Compounds, Leningrad)

SUBMITTED: September 18, 1957  
Card 2/2

KAMENSKIY, I.V.; TSVETKOV, Y.N.

Reaction between phenol and hexamethylenetetramine. Trudy MKHTI  
no.29:55-62 '59. (MIRA 13:11)

(Hexamethylenetetraline) (Phenols)

TSVETKOV, V.L.; SHALAI, V.S.

Visual nephelometer. Opt. i spektr. 7 no. 6:800-810 nm.  
(LIM. 14:1)

(Nephelometric analysis)

PHASE I BOOK REFINANCEMENT 507/985

International symposium on macromolecular chemistry. Moscow, 1966.

Makhsudovskiy slovar' po makromolekulyarnoy khimii, SSSR, Moskva, 19-18 Iyunya 1966 g. doklady i referenty. Sektzia II. (International Symposium on Macromolecular Chemistry Held in Moscow, June 19-18, 1966. Papers and Summaries) Section II. [Moscow, Izd-vo AN SSSR, 1966] 559 p. 5,500 copies printed.

Sponsoring Agency: The International Union of Pure and Applied Chemistry, Commission on Macromolecular Chemistry

Yech. M.: T.A. Prusakov.

REMARKS: This book is intended for chemists interested in polymerization reactions and the synthesis of high-molecular compounds.

CONTENTS: This is Section II of a multivolume work containing papers on macromolecular chemistry. The papers in this volume treat mainly the kinetics of various polymerization reactions initiated by different catalysts or induced by radiation. Among the research techniques discussed are electron paramagnetic resonance spectroscopy and light-scattering interpolation. There are summaries in English, French and Russian. No personal files are mentioned. References follow each article.

Mikhlin, E., and J. Keresztes (Hungary). On the Mechanism of the Formation Reaction of Stereoregular Polymers	302
Simon, A., and G. Ghyssels (Belgium). On the Kinetics of a Reaction on Zeolite Catalysts	310
Vichitsri, O., M. Marik, and I. Tinkov (Czechoslovakia). Kinetics of the Polymerization of Isobutylene on a Heterogeneous Catalyst	322
Podsk, V. (Czechoslovakia). Heterogeneous Catalysts for the Polymerization of Alpha Olefins	330
Keseli, E., I. Abad, E. Villa, and O. Hamik (Czechoslovakia). The Effect of Heavy Type Impurities on the Polymerization of Propylene. Catalysts by the System Titanium Trichloride-Triethyl-aluminum	337
Polymerization, E.A. (USSR). Study of the Factors Leading to the Degradation of Chain Structure During the Ionic Polymerization of Dienes	346
Yermolovskiy, B.L., Veng Pong-ung, and A.P. Karyunskiy (USSR). Study of the Interaction of Organometallic Compounds With Salts of Heavy Metals and the Use of Organometallic Compounds and Their Complexes to Stimulate Polymerization	355
Manto, T., and T. Gai (Hungary). The Effect of Organic Imer Complexes of Some Metals of Variable Valence on the Kinetics of the Polymerization of Vinyl Compounds	365
Reuter, S. Te., M.I. Moseritskiy, L. Ya. Podlubnyy, and Shih Kuang-i (USSR). Study of Some Details of the Mechanism of Polymerization Under the Action of Complex Catalysts	372
Santikov, V.M., S. Te. Magerit, M.I. Borkovskiy, and M.G. Oshchuk (USSR). Stereospecificity and the Optical Properties of Polymers	373
Mikheev, P.M., Yu. Ya. Gendib, and O.B. Pritsyn (USSR). The Microviscosity of Polymers and Methods of Study	383
Abkin, A.B., A.P. Shvetskiy, M.K. Yakovlev, and L.P. Moshchinskaya (USSR). On Carbonium and Carbanion Polymerization Mechanism Under the Effects of Gamma Radiation	390
Kargin, V. A., and V. A. Kabanov (USSR). Polymerization Processes in Insoluble Molecular Dispersions	393
Mishchenko, L., I. Melnik, and I. Pod (Czechoslovakia). Kinetics of the Polymerization of Formaldehyde	394
Vasely, E. (Czechoslovakia). On the Mechanism of Ionic Polymerization	395
Kisiel, L., and A. Korda (Czechoslovakia). On the Role of Monopolar Compounds in the Cationic Polymerization of Isobutylene	396

Tsvetkov, V. N.

15(6)

Author:

Title:

Abstract:

Belender, P. A., Academician NOV/50-59-1-5/57

New Trends of Colloid Chemistry (Nauyys peti ravitiya kolloidy khimii)

Vostoik Akademi nauk SSSR, 1959, No 1, pp 44-51 (USSR)

At present, colloid chemistry plays an especially important part in political economy as it is a physical-chemical science concerning substances of modern engineering. It is of great practical importance that at present it is possible to carry on uninterrupted transitions from lyophobic to lyophilic systems. Thus, it is possible to obtain technically important substances with the required structural-mechanical properties. The theory of highly molecular substances and their relations has developed into an independent branch of colloid chemistry. The vitality of modern colloid chemistry is proved by the fact that it provides many new independent branches of science. Further, the author describes the course of the development of modern colloid chemistry. The author also mentions the 4th All-Union Conference on Colloid Chemistry, held in Moscow, 1958, and the 15-16, 1958. It was organized by the State Science Administration.

V. A. Kargin, S. I. Borzhenov described the synthesis of aluminum-silicon jelly of crystalline structure. V. M. Yurshakov et al. examined the optical properties of colloidal systems. The author also mentions the 4th All-Union Conference on Colloid Chemistry, held in Moscow, 1958, and the 15-16, 1958. It was organized by the State Science Administration.

Card 5/6

S. M. Kipshin, S. I. Borzhenov referred to the colloidal results of thermomechanical and dilatometric examination of the transition of gelatin jelly into a liquid solution at a rise in temperature. A. I. Yurshakov and collaborators reported on questions of compatibility of polymers and their solutions. V. A. Kargin, P. I. Zabor and collaborators discussed the process of gelatin formation and its role in sticking processes.

S. M. Kipshin, S. I. Borzhenov referred to the colloidal results of thermomechanical and dilatometric examination of the transition of gelatin jelly into a liquid solution at a rise in temperature. A. I. Yurshakov and collaborators reported on questions of compatibility of polymers and their solutions. V. A. Kargin, P. I. Zabor and collaborators discussed the process of gelatin formation and its role in sticking processes.

Card 6/6

of spontaneous dispersion of solid bodies, especially metals, in surface-active surroundings. V. I. Kishin reported on the appearance of adsorptive phenomena of lead and tin at normal temperatures. E. A. Kharachinskiy and collaborators examined the influence of the mechanical properties of printing colors on their behavior in the printing process. I. M. Kharachinskiy reported on the regulation of crystallization and degeneration structure in the production of best table-  
better.

TSVETKOV, V.N.; CHANDER, R.K.

Diffusion, viscosity, and molecular dimensions of polydimethyl-  
siloxane in solution. Vysokom.sped. 1 no.4:607-612 Ap '59.  
(MIRA 12:9)

1. Leningradskiy gosudarstvennyy universitet.  
(Siloxanes)

TSVETKOV, V.N.; LYUBINA, S.Ya.

Flow birefringence of polybutylmethacrylate solutions. *Vysokom.*  
soed. 1 no.6:857-862 Ja '59. (MIRA 12:10)

1. Institut vysokomolekulyarnykh soyedineniy AN SSSR.  
(Methacrylic acid) (Refraction, Double)

5 (3), 5 (4)

AUTHORS:

Tsvetkov, V. N., Magarik, S. Ya.

SOV/20-127-4-32/60

TITLE:

Optical Anisotropy of Molecules of Isotactic Polystyrene

PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 127, Nr 4, pp 840 - 843  
(USSR)

ABSTRACT:

The isotactic and atactic polymeric molecules with different structures could hitherto only be observed in the solid phase. On the other hand, the investigation of the structure of the polymers by the methods available is only possible in dilute solutions. The present paper tries to investigate the stereospecific features of the above polymers by comparative investigations of the optical anisotropy of the isotactic and atactic forms. Investigations were carried out by means of polystyrene. From X-ray pictures, the crystalline structure of isotactic polystyrene was determined. The molecular weight was determined by the light diffusion in toluene to be equal to 800,000. The X-ray pictures were made by L. A. Volkova at the laboratory of Professor M. V. Vol'kenshteyn, and the molecular weight was determined by V. Ye. Eskin at the laboratory mentioned below. The optical anisotropy was determined by measuring the radiation

Card 1/3



Optical Anisotropy of Molecules of Isotactic Poly- SOV/20-127-4-32/60  
styrene

double refraction in a bromoform solution (bromoform has the same refractive index as polystyrene without a form effect). For the ratio  $[n]/[\eta]$ , which permits calculations of  $(\alpha_1 - \alpha_2)$  = the difference of the two principal polarizabilities of a statistic molecule segment, the Peterlin's relation  $\Delta n/g(\eta - \eta_0)$  was used. In this case, the concentration of polystyrene in the solution need not be determined.  $\eta, \eta_0$  are the viscosities of the solution and solvent. Table 1 shows the values for the double refraction and the viscosity of the two types of styrene.  $[n]/[\eta]$  amounted to  $-20.0 \cdot 10^{-10}$  for the isotactic molecule, and to  $-13.1 \cdot 10^{-10}$  for the atactic molecule. The values for  $[n]/[\eta]$  and  $\Delta n/g(\eta - \eta_0)$  were in good agreement. The optical anisotropy  $(\alpha_1 - \alpha_2)$  was calculated by the formula in reference 18. It amounted to  $-224 \cdot 10^{-25}$  and  $-146 \cdot 10^{-25}$  for the two forms. The latter value agrees with data of other papers (Refs 20-24). The difference found for the optical anisotropy was ascribed

Card 2/3

Optical Anisotropy of Molecules of Isotactic Poly- SOV/20-127-4-32/60  
styrene

to two causes: (1) A change in the configuration of the principal molecule chain, an increase in the stereoregularity, change the optical anisotropy. (2) By the transition of the molecule to a more stereoregular state, the degree of delayed turn in the lateral groups of the molecule varies. In the transition from the isotactic to the atactic molecule, a delayed turn of the C<sub>aliphatic</sub>-C<sub>aromatic</sub>-bond takes place, which enlarges the negative anisotropy of the chain, which was also detected in investigations. The method used can also be applied to a quantitative determination of the degree of stereoregularity of polymers. There are 4 figures, 1 table, and 28 references, 12 of which are Soviet.

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniy Akademii nauk SSSR  
(Institute of High Molecular Compounds of the Academy of Sciences, USSR)

PRESENTED: March 27, 1959, by A. A. Lebedev, Academician

SUBMITTED: March 27, 1959  
Card 3/3

TSVETKOV, V. N., MAGARIK, S. YA., BOYTSOVA, N. N. and OKUNEVA, M. G. (USSR)

Stereospetsifichnost i opticheskie svoistva polimerov

Stereospecificity and optical properties of polymers

IUPAC S II: 378-87

report presented at the Intl. Symposium on Macromolecular Chemistry, Moscow,  
14-18 June 60.

SATOVSKIY, Boris Ivanovich; YARTSEV, Grigoriy Matveyevich; YASHNEV,  
Dmitriy Andreyevich [deceased]; TSVETKOV, Vladimir Nikolayevich;  
POLESCHCHUK, Pavel Iosifovich; DIDKOVSKIY, D.Z., otv.red.;  
KAUFMAN, A.M., red.izd-va; BOLDYREVA, Z.A., tekhn.red.

[Modern excavators for open-pit mining] Sovremennye kar'ernye  
ekskavatory. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po gornomu  
delu. 1960. 423 p. (MIRA 13:11)  
(Excavating machinery)

TSVETKOV, V.N.; LYUBINA, S.Ya.

Volume effects and shape asymmetry of macromolecular chains  
in solution. Vysokom.soed. 2 no.1:75-81 Ja '60.  
(MIRA 13:5)

1. Institut vysokomolekulyarnykh soyedineniy AN SSSR.  
(Macromolecular compounds)

SKAZKA, V.S.; TSVETKOV, V.N.; ESKIN, V.Ye.

Asymmetry of the critical opalescence in polymer solutions.  
Vysokom. soed. 2 no.4:627-628 Ap '60. (MIRA 13:11)  
(Polymers)

TSVETKOV, V.N.; SHTENNIKOVA, I.N.

Flow birefringence of poly-para-tert.butylphenyl methacrylate  
solutions. Vysokom.soed. 2 no.5:646-657 My '60. (MIRA 13:8)

1. Institut vysokomolekulyarnykh soyedineniy AN SSSR.  
(Methacrylic acid) (Refraction, Double)

TSVETKOV, V.N.; SHTENNIKOVA, I.N.

Form of ethylcellulose molecules. Vysokom.sosd. 2 no.5:808-816  
My '60. (MIRA 13:8)

1. Institut vysokomolekulyarnykh soyedineniy AN SSSR.  
(Cellulose--Optical properties)



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S/190/60/002/007/003/017  
B020/B052

15.8116

AUTHORS: Tsvetkov, V. N., Frisman, E. V., Boytsova, N. N.

TITLE: Optical Anisotropy and Shape of Siloxane Polymer Molecules  
in Solution

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 7,  
pp. 1001-1009

TEXT: Here, the flow birefringence method is applied for the investigation of polydimethyl siloxane (PDMS) and polydimethyl-phenyl siloxane (PDMPs) solutions. The samples investigated were fractions of the commercial polymers PDMS and PDMPs; the latter, however, contained 10% monomer chain links with a benzene ring as substituent of the methyl group. The molecular weights of the fractions investigated were determined by the light scattering method (Refs. 2,3) and, in the case of PDMS, also from the intrinsic viscosity in toluene by the equation

$[\eta] = 4.2 \cdot 10^{-4} M^{0.59}$  (1) (Ref. 2). Gasoline was used as solvent in the determination of the anisotropy of the molecular segment on the basis of

Card 1/4

87024

Optical Anisotropy and Shape of Siloxane  
Polymer Molecules in Solution

5/190/60/002/007/003/017  
B020/B052

birefringence. The birefringence of the PDMS fractions in toluene were measured for the investigation of the effect of shape. The absolute viscosity  $\eta$  and intrinsic values  $[\eta]$  of all solutions were determined besides their optical characteristics. Fraction II ( $M=1.79 \times 10^6$ ) and an unfractionated PDMS sample with an average molecular weight of  $7.10^5$  in gasoline, were examined. In all the cases, the dynamic birefringence  $\Delta n$  increased proportionally to the velocity gradient  $g$  (Fig. 1). The concentration dependence of the quantity  $(\Delta n/gc\eta_0)_{q \rightarrow 0}$  (with  $\eta_0$  denoting the viscosity of the solvent) is given in Fig. 2. The characteristic values of birefringence  $[n] = \lim_{c \rightarrow 0} (\Delta n/gc\eta_0)$  obtained by extrapolation  $q \rightarrow 0$

of the straight line of Fig. 2, are given in Table 2. Three fractions of PDMS (III, V, and VII) in gasoline were investigated. The birefringence of all solutions was negative and very low. For the determination of the characteristic values  $[n]$  and  $[n]/[\eta]$  therefore the Peterlin method (Tables 1 and 2) was also applied besides the graphical solution of the equation  $(\Delta n/gc\eta_0) = f(c)$  (Fig. 3) for fractions V and VII (where the

Card 2/4

87024

Optical Anisotropy and Shape of Siloxane  
Polymer Molecules in Solution

S/190/60/002/007/003/017  
B020/B052

extrapolation of  $c \rightarrow 0$  seems less promising). Table 3 gives the characteristic data of PDMS in toluene. The dependence of

$[n] / [\eta] \cdot (45n_s kT) / (4\pi(n_s^2 + 2)^2)$  on  $M/[\eta]$  and

$[n]_f \left\{ \left[ \frac{n_k^2 - n_s^3}{n_s^2} \right] \left[ \frac{1}{120\pi p^2 RT} \right] \right\}$  of the molecular weight of polydimethyl

siloxane in toluene are given in Figs. 4 and 5. Fig. 6 shows the trans-chain of polydimethyl siloxane, and Fig. 7 the monomer link of methyl-phenyl siloxane. On the basis of the data obtained one may say that the quantity of the effect of shape is proportional to the molecular weight of the fraction. The determined asymmetry of the coiled PDMS is somewhat lower than the values usually obtained for Gauss chains. The segmental anisotropy of PDMS in gasoline is  $4.7 \cdot 10^{-25} \text{ cm}^3$ , and that of PDMPs is

$2.3 \cdot 10^{-25} \text{ cm}^3$ . Thence the anisotropy of the monomer link was calculated:  $0.96 \cdot 10^{-25} \text{ cm}^3$ , and  $13.4 \cdot 10^{-25} \text{ cm}^3$ , respectively. From these data the difference in the anisotropy of the compounds SiC and SiO can be calculated as being  $1.1 \cdot 10^{-25} \text{ cm}^3$ . On the basis of the data obtained for PDMPs one

Card 3/4

87024

Optical Anisotropy and Shape of Siloxane  
Polymer Molecules in Solution

S/190/60/002/007/003/017  
B020/B052

may say that practically no slowing down of the phenyl side-group (in the sense of a favored orientation of its faces) occurs during its rotation round the valence bond  $C_{aromat.} - C_{aliphatic}$ . The authors thank I. K. Stavitskiy and V. M. Svetozarova for having supplied the polymer samples. There are 7 figures, 3 tables, and 19 references: 13 Soviet, 3 US, 2 German, and 1 Swiss. ix

ASSOCIATION: Fizicheskiy institut Leningradskogo gosudarstvennogo universiteta (Physics Institute of the Leningrad State University)

SUBMITTED: March 4, 1960

Card 4/4